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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/506,540

09/03/2004

Yoshitada Oshida

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EXAMINER

WHITESSELL GORDON, STEVEN H

ART UNIT

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/506,540	<b>Applicant(s)</b> OSHIDA ET AL.	
	<b>Examiner</b> Steven Hunt Whitesell-Gordon	<b>Art Unit</b> 2851	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 03 March 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 15, 16 and 21-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 15, 16 and 21-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>9/10/2008, 11/24/09, 3/3/09</u> .                             | 6) <input type="checkbox"/> Other: _____                          |

### DETAILED ACTION

1. Acknowledgment is made of Amendment made 3 March 2009. Claims 1-5, 7, 8, 10-12, 14 and 17-20 are cancelled and claims 15, 21 and 24 are currently amended.

#### ***Claim Objections***

2. Claims 15 and 24 is/are objected to because of the following informalities:
  - a. Claim 15, line 23, "ration" should be rewritten as --rate-- or --ratio--,  
because it unclear how divergence angles can be adjusted to stay within a ration.

Appropriate correction is required for claim objections above.

#### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. **Claims 15, 16, 21-14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.**

**Claims 15 and 24** recites the limitation "each section repeated in a circumference direction" in line 28 of claim 15 and line 7 of claim 24. There is insufficient antecedent basis for this limitation in the claim. Specifically it is unclear if each section is attributed to the disc or the radical form. In view of the specification and for the purposes of examining it understood that each section is a circular sector repeated around the disc.

**Claim 24** recites the limitation "said light integrator" in line 9. There is insufficient antecedent basis for this limitation in the claim. Furthermore, it is unclear how the light

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integrator is a part of the rotating modulator. As best understood by the examiner, this limitation of "said light integrator" is provided to give an intended positional relationship of the rotating modulator when used with a light integrator.

**Claims 16 and 21-23** are rejected due to their dependency on claim 15.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. **Claims 15, 16, 21, 22 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suganuma [US 5,662,410] in view of Uchida et al. [JP 2000-048613, cited by Applicant] and Ben Oren et al. [US 5,969,872].**

**For claims 15, 21, 22 and 24**, Suganuma teaches a light exposure apparatus (see Fig. 2) that comprises: an illumination optical system including: a light source (1); a condensing optical system (3) for condensing light emitted from said light source; a light integrator (5) for spatially decomposing the light condensed by said condensing optical system, and thus generating a multitude of secondary light source images (see fig. 5); and a condenser lens (6) for overlapping the light rays emitted from the multitude of secondary light source images generated by said light integrator (see Fig. 5 and col. 5 lines 25-33), and thus illuminating an illumination target region (on mask 7) having a pattern to be exposed (see col. 3 lines 66-67); and a projection optical system (8) for

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projecting transmitted or reflected light onto an exposure target region of an exposure target object (9) in order to expose the pattern to be exposed that is illuminated by said illumination optical system (see col. 3 line 51 - col. 4 lines 5); and wherein said illumination optical system further includes a rotating modulator (2) formed by rotating a glass disc (see col. 4 lines 6-29) on the incident side (see Fig. 1) or exit side of said light integrator to prevent generation (occurrence) of interference fringes on the overlapped illumination target region.

Suganuma does not appear to disclose the light source is an array formed of a plural separate semiconductor laser diodes arranged one-dimensionally or two-dimensionally; with a condensing optical system for condensing light emitted from each semiconductor laser diode of said light source array; and wherein said illumination optical system further includes divergence angle adjusting optical system which divergence angles in the light flux emitted from each of the semiconductor laser diodes are adjusted to stay within a ratio of 1 versus 1.5 with respect to any two direction with a plane vertical to an optical axis of the emitted light flux.

Ben Oren teaches the light source is an array formed of a plural separate semiconductor laser diodes arranged one-dimensionally or two-dimensionally (100 and 104, see Figs. 9 and 10); and wherein said illumination optical system further includes divergence angle adjusting optical system (lenses 108, 112, 120 and 122) which divergence angles in the light flux emitted from each of the semiconductor laser diodes are adjusted to stay within a ratio of 1 versus 1.5 (see collimation of light exiting 108,

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112, 120 and 122) with respect to any two direction (x and y direction, slow and fast axis) with a plane vertical to an optical axis of the emitted light flux, wherein said divergence angle adjusting optical system is formed with two cylindrical lenses (re claim 21, 108, 112, 120 and 122), wherein the illumination optical system further includes light source control means (re claim 22, 130) for performing energy control of the light emitted from said light sources of said light source array (see col. 13 lines 1-5).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the light source array with controller and divergence angle adjusting optical system as taught by Ben Oren in place of the light source taught by Suganuma, because the light source array could provide for a more control over the light source illumination uniformity for providing improved depth of focus and resolution with regard to the pattern exposure, further allowing for reducing exposure time when compared to exposure light sources providing no directionality like mercury or xenon-mercury lamps.

Suganuma does not explicitly disclose that the modulator is processed (polished) in a radical form so that its surface height shape in each section repeated in circumference direction varies in nearly a sinusoidal fashion and the surface height variation is several microns.

Uchida teaches modulator is processed (polished) in a radical form so that its surface height shape in each section repeated in circumference direction varies in early

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a sinusoidal fashion (see [0019] and Figs. 1 and 5) and the surface height variation is several microns (see [0033]).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the radical form as taught by Uchida in the modulator taught by Suganuma, because this could scatter the light in the optical path providing for homogenous and uniform light distribution, reducing uneven light that can create hot spots on the mask.

**For claim 16**, Suganuma teaches in a illumination optical system, a region in which the plurality of light sources are arranged, or a light emitting region of the secondary light sources obtained from the plurality of light sources is made analogous to a shape of the region to be illuminated, (see Fig. 5 and col. 5 lines 7-34)

**7. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suganuma in view of Uchida and Ben Oren as applied to claim 15 above, and further in view of Sakato [US 4,512,657].**

Suganuma as modified by Uchida and Ben Oren does not appear to explicitly teach a detector for measuring intensity of the light emitted from said light source of said light source array.

Sakato teaches a detector (6, see Fig. 1) for measuring intensity of the light emitted from a light source (1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate a detector as taught by Sakato in the exposure

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apparatus as taught by Suganuma as modified by Uchida and Ben Oren, because the detector could allow for measuring the intensity of the light incident on the mask in order to better control the intensity of the light incident on the mask for appropriate exposure.

***Response to Arguments***

8. Applicant's arguments with respect to claim 15 and 24 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven Hunt Whitesell-Gordon whose telephone number



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is (571)270-3942. The examiner can normally be reached on Monday to Thursday, 9:00 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diane Lee can be reached on 571-272-2399. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/S. H. W./  
Examiner, Art Unit 2851

/Diane I Lee/  
Supervisory Patent Examiner, Art Unit 2851